I. Method of Working

Scope of report

1. The Committee concentrated its study on the problems of, and the relationships between the Process Industries, the Process Plant Contractors, and the Process Plant Manufacturers.

Site problems

2. The Committee did not study the site problems that contribute significantly to late completion in the knowledge that these problems are under investigation by the NEDO Working Party on Large Industrial Construction Sites, under the chairmanship of Mr. T. A. L. Paton.

Parallel studies

3. In addition to the NEDO Process Plant Working Party, with which the Committee had special contacts, the Committee recognized that there were numerous other bodies, such as the Industrial Reorganization Corporation, Economic Development Committees and Sub-Committees, Trade Associations, who have studied and are at present studying various specific areas of the Process Plant Industry. Indeed, the problems of sectors of the Process Plant Industry have been analyzed, pin-pointed, reported upon and publicized in innumerable documents and, with little exception, make somewhat dismal reading. The Committee has endeavoured to avoid unnecessary overlapping with these studies and to concentrate more on a broad approach to the general picture.

Discussions with industry

4. The Committee felt, with the background of previous reports and the experience of its members, together with the requirement to report in a relatively short time, that it should not seek formal evidence from the Process Industries, Process Plant Contractors or Plant Manufacturers; but it has sought the views of a cross section of all these sectors by individual and collective discussion. The help and assistance given by various individuals, companies and organizations are gratefully acknowledged.

II. The Broad Problem

5. Our discussions with industry confirmed that there was little sense of common interest between the three interdependent sectors, or even an understanding of the need for it. Indeed, the Committee was forcefully impressed by failures of communication and collaboration, by the lack of mutual trust and confidence between the three sectors and by the recrimination that persists. It is worth reviewing the underlying and largely historical reasons for this situation.

6. The Process Industries are relatively new and encompass rapidly expanding technologies allied to production on an ever-increasing scale. Three or four companies dominate the UK Chemical Industry ; similarly, the Oil Industry in the UK consists mainly of a few very large and powerful international companies.

7. By comparison the UK Plant Manufacturers, who supply not only the Process Industries, but also allied industries and organizations in the public sector, are numerous, and in general both small and lacking in modern management concepts. There are, of course, some outstanding examples of equipment manufacturing companies with highly efficient managements and good export performance, nor is it suggested that size is necessarily synonymous with efficiency, particularly in companies making a range of specialized equipment. But it is generally true that the smallness and lack of specialization of the manufacturing companies with which this report is mainly concerned make it financially impossible for them to support modern production and management techniques, worthwhile research and development, and imaginative market research coupled with effective selling and after-sales service at home or abroad ; it is also difficult for them to invest the capital necessary to concentrate their production on specialist items. Certainly it is difficult for them to attract managers and engineers of the high calibre found within the process and contracting companies and this in itself leads to lack of confidence. The adapting and grafting of these fragmented and generally ineffectively managed mechanical engineering companies to the needs of the process industries has, like all such operations, been painful and so far not very successful.

8. Between the Process Industries and the Manufacturers are the Process Plant Contractors, who in general have the same outlook and modern approach to management and technology as the Process Industries. In many cases they provide a link between the Process Industries and the Manufacturers.

9. So far as the Contractors themselves are concerned they are of course small in relation to their customers—one might say their patrons—the Process Industries. While the progress and record of performance of the UK-owned Contractors over the last ten years or so has been impressive, they do not yet appear to have reached the powerful position, particularly in the technical field, of some of their overseas competitors. It would also appear that there is a need for closer personal relationships with the top level management of the Process Industries. Further, the UK Contractors do not yet have the required experience or know-how to break the virtual monopoly of the US Contractors in the oil refinery business and in some aspects of the petrochemical industry.

10. Thus we have an unequal triangular structure of user, contractor and manufacturer, where the tremendous gulf in size, financial strength, technical and managerial competence, and general business philosophies, has made communication, confidence and collaboration so difficult.

11. The Committee strongly believes that the necessary improvement in plant supplies for the Process Industries must in the main be the responsibility of all three sectors of industry concerned and recognizes that its main task has been to seek means of accelerating the disappointingly slow progress in achieving this improvement. With this background its aim has been to consider what steps the Process Industries, the Process Plant Contractors and the Plant Manufacturers can take, individually and collectively, to create the conditions for improvement. The prime objective must be a new sense of common interest and a greater degree of collaboration and trust.

III. Co-ordination of the Process Industries and Process Plant Suppliers

General

12. The process industries are international in character and as such must have the best and most modern processes and equipment if they are to compete in world markets. They are under no obligation to experiment by employing UK process plant contractors who may not have previously designed a specific type of plant, nor do they have any obligation to risk the success of a plant by installing UK-manufactured equipment that has not been proved in practice. Thus we often have a 'chicken and egg' situation, inasmuch as the plant suppliers cannot gain the experience they need, while the process industries understandably prefer to use contractors and plant manufacturers who have already had the appropriate experience and in whom they can therefore have the highest degree of confidence.

13. At the present time this particular problem applies more to the choice of process plant contractor than to equipment manufacturers, but as plants grow larger and more complex so will there be a requirement for larger and more complex equipment than has previously been made in this country. It is important that all three main sectors of the industry are prepared to become involved in building up an effective British supply capability in their own and the national economic interest. The process industries must make a positive effort to give the competent contractor the support needed, and both in turn must encourage the forward-looking and better-managed manufacturer willing and competent to grasp opportunities, so that the industry as a whole can have available the equipment and service required.

14. A satisfactory resolution of this difficulty, different aspects of which are discussed elsewhere in this report, would help to improve the capability of UK contractors and UK plant manufacturers to meet the needs of the process industries. The UK contractors, backed by new experience and know-how thus gained could then seek overseas contracts previously outside their reach and UK plant manufacturers could supply the necessary equipment and at the same time increase their capability for direct exports.

Cyclical demand

15. The process and allied industries, including organizations in the public sector, have exhibited large and rapid swings in their rates of investment; when all these industries achieve a high rate of investment at the same

time, the supply capability of the plant manufacturers comes under severe strain. It is odd that this should occasion surprise, as it seems to have done, and it is one of the most valuable achievements of the Process Plant Working Party to have high-lighted the nature and extent of this problem and its consequences both to manufacturers and their customers.

16. It would be unreal to hope that such swings can be damped out entirely but a realistic appraisal of the consequences should at least lead to a reduction in their magnitude to a level with which a more efficient manufacturing industry could cope. We have been encouraged to find two very large process industry companies, and there may well be others, which claim no longer to allow relatively short term alterations in market situations to affect their steady long term investment programme. This requires effective analysis of the situation, and courage in the implementation of its results; but if more large companies and the public sector could adopt the same approach this would greatly benefit the plant supply situation to their own and the nation's economic advantage.

Forecasting and technical collaboration

17. The oil companies have fairly well defined forecasts of their process capacity over the next ten years and to a lesser extent this applies to some sectors of the chemical industries. Both industries, together with other major users, now provide investment forecasts three years ahead to the Process Plant Working Party and these are proving of increasing value.

18. Similarly it is known in general terms that the size and complexity of plants are likely to continue their rapid increase in the future. This will bring organizational problems and increased complexity of managerial processes. All of these factors indicate the need for greater collaboration between customer and contractor. A recent example is the collaborative effort between an oil company and an American contractor for a large olefins plant in Texas, where the research and engineering design was carried out by a joint team from both companies. Such close co-operation sets a pattern for the future, and it will be essential to develop this collaboration in the UK both to strengthen the technical efficiency of plant design and supply and to lessen our dependence on the importation of developments and techniques from elsewhere.

19. Such technical collaboration, it seems to the Committee, must to an increasing degree start with collaboration between the process industries and the Contractors. The Committee has been struck by the evidence in

the Freeman Report* which suggests that the British process plant contracting industry has benefited less from access to new home processes than have its US and Italian counterparts. It seems that British processes have been more widely used abroad than those of any other European country, yet the UK contracting industry has been slightly less successful in the world than the US, Italian and German. This may be partly explained by lack of sufficient experience at home of building plant embodying new processes, and the greater readiness of some British oil and chemical companies to collaborate with overseas contractors. We cannot over-emphasize the importance to the contractor of being associated with the process company at the earliest practicable stage of the development of a new process which has export potential. This goes to the heart of the developing relationship between the process company and the contractor. While we recognize the difficulties faced by the process companies in risking early disclosure of highly confidential information we urge the most sympathetic consideration of the need to maximize national returns and of the genuine contribution that can be made by an experienced contractor. Other countries seem to have overcome similar difficulties to a greater extent than we have.

20. To achieve this close research and development collaboration the process industries and process plant contractors must also be able to deal with manufacturing companies that are capable of developing newer, bigger and more sophisticated hardware. Clearly the small companies will find it difficult, if not impossible, to have this capacity, and this emphasizes the need for rationalization and the financial strengths necessary to support such work. However, if the process industries were prepared to collaborate more in new concepts of plant and materials with companies that were willing to create the necessary capability, this would add strength and impetus to rationalization moves and also to the endeavours and subsequent influence of the Industrial Reorganisation Corporation where it is involved.

21. The Committee would not wish it to be believed that no technical collaboration in development of plant and materials takes place at the moment. There are many instances where it has happened and is happening. There are also instances of it not happening. For example, in one of its discussions with a major user, members of the Committee heard authoritative views of a major technical development involving the use of steels not at present made in this country. This information had not been given by the user to the appropriate process plant manufacturing industries, and the suggestion that it might have been offered evoked

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* " Chemical Process Plant Innovation and the World Market " C. Freeman, NIESR Review, *45*, August, 1968, pp 29–74.

surprise. It is true that the plant suppliers have a duty to themselves to seek out such information (although this in turn indicates the need for stronger manufacturers and stronger manufacturers' trade associations able to do this) but it is also true that the process industries, in their own self-interest and to the benefit of their supplying industries, have a duty to avoid the waste which can result from the late appearance of such information. This is an example of the lack of collaboration which can be so damaging to the overall efficiency of the industry.

More effective influence with plant suppliers

22. The need for rationalization in many sectors of the engineering industry is generally recognized, with certain understandable caveats among the manufacturers themselves. The Committee has been impressed by the rationalization that has occurred and is still taking place within the electrical plant manufacturing industry. This process has been continuing for 10 years or more and owes much to the efforts of the CEGB which, in its own self-interest, encouraged companies who were prepared to merge or rationalize their productions by providing technical incentive and commercial support. The Committee believes that although this rationalization has not been without its problems it has nevertheless been in large part to the advantage of the plant manufacturers. It has assisted them to maintain a position among the world leaders in those products where the collaboration has been closest. A notable example has been the development of large turbogenerators. In a different field the Committee has been impressed by the example of the beneficial influence exercized by the firm of Marks & Spencer on its supply industries. Although this firm only takes 11 per cent. of the textile output of the UK and 1 per cent. of the food output its insistence on high standards of quality and its emphasis on simple but effective management methods have had a profound influence through a much greater proportion of its supply industries than that represented by its own share of the market.

23. The Committee observes that no comparable move has been made in the process plant field, although the purchasing influence of the major process industry customers is great. It could be most beneficially used in encouraging the emergence of more powerful and efficient groups of manufacturers with greater resources and enhanced ability to provide adequate levels of capital investment, research and development, marketing, and technical services. The Committee considers that it would be in the long term interests of the process industries themselves, as well as of the manufacturers, if the major customers in both the private and the public sectors could each consider how his purchasing power could

best be used, and the Committee recommends that the Minister of Technology should initiate discussions to this end.

24. The Committee notes that the Industrial Reorganisation Corporation has been active in encouraging mergers among pump, valve and pressure vessel manufacturers and has had some success. Its approach is pragmatic and sensible in the belief that if it can achieve one logical merger in a section of industry then the new company will be a catalyst for other mergers and groupings. The Committee has been impressed by the capacity of the IRC to carry out a study in depth before a merger is recommended, to ensure that the merger is beneficial to manufacturers and users and to the country's export efforts.

25. The Committee feels that the Industrial Reorganisation Corporation could achieve more, and achieve it more quickly, if newly emerged groupings of plant manufacturers knew that they could rely on the reasonable continuing support and encouragement of the major customers ; this support would go far to ensure that the objectives of rationalization, discussed in more detail later, are in fact achieved.

Tendering procedures and purchasing policy

26. There are many types of contract which may be adopted and volumes have been written on the advantages and disadvantages of the various forms these may take. Fixed price tenders for completely specified projects lie at one extreme ; completely negotiated contracts for projects which cannot be specified in any detail at their inception lie at the other. It is vitally important that the best form of contract, taking cognizance of all the factors involved—degree of development of the process, relative expertise of the customer and contractor, project programme, the degree of urgency of the job, market conditions, etc.—be arrived at for each contract. To achieve this and to ensure the maximum of collaboration and understanding during the project, it is necessary for (*a*) the client, and (*b*) the short-listed contractors or selected contractor, to agree on the form of contract to be used for each job. The impression left with the Committee is that this has not been adequately achieved and that not enough analysis is carried out in advance by the customer.

27. Many process plant contractors have affirmed that too much emphasis is frequently placed on achieving the lowest capital cost rather than on obtaining the job which, taking all things into consideration, including completion time, reliability of equipment, and likely commissioning problems, will give the lowest overall product cost for the desired product

quality. Excessive emphasis on the lowest cost will in turn lead the contractor to " squeeze " the manufacturer in like manner with all the consequential after-effects, resulting almost inevitably in late deliveries and unreliable and inadequate equipment from poorly managed manufacturers. Plant manufacturers complain strongly that in fact price is too often treated as the only important factor, both by the contractor and by the process user purchasing directly, and that as a result they find themselves under extreme pressure to reduce their prices to a level which threatens both their own viability and their ability to service the industry in the longer term.

28. Excessive multiple tendering in an uncontrolled manner is a frequent source of friction and a waste of effort and resources. This arises from two sources: firstly, when process industries and/or process plant contractors request an excessive number of competitive bids for plant or items of equipment; secondly, when too many process plant contractors are bidding for the same contract and request tenders for the same or similar plant items. The confusion and duplication which thus arise naturally reach their peak at the manufacturers' level.

29. It is widely accepted that loose requests for tenders by the process industries and the process plant contractors add to the problem; often enquiries do not indicate whether or not they are for estimating and evaluation purposes only or whether they are likely to be followed by an order. If manufacturers knew that an inquiry was limited and firm, they would be better able to devote the time and effort needed to provide the quality of information required. More care in the preparation of enquiries, coupled with a clear, studied and accurate statement of the requirement and the more intelligent selection of a limited number of vendors is necessary if this potential for misunderstanding and waste of resources is to be reduced.

30. The Committee recommend that the process and allied industry customers should initiate a high level review of the practical result of their purchasing policies and of the types of contract used in order to select the best form of contract for each project. There should be a more careful choice of the type of contract used, greater co-operation with selected contractors and/or manufacturers in making this choice, steps to reduce the extent of multiple tendering and more thought to all the factors affecting the choice of supplier. It is our belief that this will lead to greater use of negotiated forms of contract and to the lesser use of ill-conceived, fixed-price contracts; the value of this will become greater as projects become larger and more complex.

IV. Objectives—Process Plant Contractors

Background

31. Even after the 1939–45 war, chemical manufacturers in the UK continued to design their own plants and procured their hardware direct from the component manufacturers; today the greater part of the new plants built in this country are engineered, procured, and constructed by the process plant contractors. The gas industry in Europe has always used plant contractors, and the oil industry in the United States pioneered the change in the chemical and oil industries; many of the UK contractors who began in gas are now leading contractors for the chemical industry. The change was closely associated in time with the shift in base materials from coal derivatives to oil and natural gas, the switch from batch to continuous processes, and a much greater readiness to license process know-how. As refineries and chemical plants have become more complex and integrated units rather than conglomerations of separately built components, the process plant contractors' services have widened to include not only engineering but particularly management with overall planning and cost control.

32. Apart from their specific technical role in the process industries the process plant contractors are the entrepreneurs and seekers of commercial opportunities. They are constantly on the alert throughout the world to learn of developments of existing or new processes, their success depending in great measure on the closeness of their relationship with the process industries. This relationship with the great international process companies has to be fostered and sustained so that every opportunity of new business is known to them at the earliest planning stage.

33. The process plant contractors are the front men for the British plant manufacturers, and their reputation and even their viability rests not only on their own technical and management abilities but also on the performance, both in delivery and quality, of the manufacturers. They are responsible for more exports of process plant equipment than the manufacturers themselves and as such merit support from the Process Industries, the Plant Manufacturers and the Government. However, the UK contractors appreciate that at present they have not succeeded in breaching the near monopoly of the American contractors in the oil refinery industry. They also appreciate that their present export business rests mainly on the under-developed countries where aid funds and ECGD terms are available, and on Eastern Europe. These markets are likely to become more competitive as the European and Japanese contractors develop and as and when American contractors begin competing for Eastern European contracts.

The present need

34. The Committee is strongly of the opinion that the UK contractors need to be stronger financially and technically in order to reach into new markets to handle the ever-increasing size and complexity of process plants. While their progress has been impressive and their international business has risen steadily in absolute terms, their share of the increasing business available is not increasing. There is a national need for at least one contracting organization capable of undertaking the largest process industry projects anywhere in the world without risking financial disaster from a single failure.

35. The Commitee has not been attracted by the possible alternative of a state-backed organization, despite some success that this method has achieved in some other countries. It prefers the independent status, albeit with sympathetic support from Government and industry.

36. However, in discussing this need for strengthening an independent industry, the Committee found a reluctance on the part of several UK process plant contractors to agree to the need for merging into larger companies. Their argument was that they all had generally the same know-how and that merging might not broaden their technical base. There is some logic to this argument and clearly it would be more satisfactory to have mergers of complementary know-how. However, even mergers of companies that work in the same technologies should result in a stronger international effort. At present, there is no UK process plant contractor with a substantial international organization and until this is achieved we cannot expect significant orders in those areas where the Americans or others have established well staffed engineering offices. The number of contractors in the United Kingdom, so far from diminishing, is increasing all the time as new firms enter the field from, for example, the fabrication industry or the civil contracting field.

37. A major need in the immediate future will be for a rapid penetration of the North and South American markets, the latter in particular being at a critical point in its growth. Increasing integration of the British industrial effort with that of Western Europe is another important aspect of the contractors' future development and their future relationship with the highly effective and rapidly developing Japanese industry must also be taken into account. All these problems will be better coped with by the strong international organization which the larger contractor can develop. This organization will simultaneously improve the contractor's ability to gain access to early market intelligence, which will in turn improve his

chances of influencing the form of contract. It will also enable him to make greater use of the commercial intelligence services provided by the British Embassies.

The immediate action required

38. It is the belief of the Committee that discussions should be held among the major UK contractors with the object of identifying the quickest and most advantageous method of bringing about the emergence of a small number of powerful contracting companies to meet increasing international competition.

39. The process industries cannot be expected to support proposals with which they do not agree, but if the contractors produce proposals that are sound and will achieve the objectives, then in turn they will need assurance that they can reasonably expect to receive support from the process industries in implementing these proposals, and in particular close collaboration in new projects and processes. Support could also be expected from the IRC in such ways as were appropriate in the particular circumstances.

40. Where a process company finds it necessary to employ a foreign contractor because of the particular experience he may be offering, the Committee believes that, wherever practicable, the user should arrange for a UK contractor to be associated with the project in such a way that his experience and expertise in the more sophisticated aspects of the work are positively and significantly enhanced.

41. Without such strong combinations emerging, and without support of the kinds indicated, the Committee believes that the present companies will experience serious difficulty in combating the ever-increasing and ever-strengthening competition to which they will be exposed.

Possible routes to greater strength

42. In considering how best to bring about the emergence of a small number of powerful contracting companies, and their most effective deployment internationally, both in the immediate future and in the coming decade, the contractors would no doubt take into account various possibilities for groupings and orientations. In addition to the comments made above on possible international linkages, the Committee heard a number of suggestions for strengthening the plant contractors, including those given below. These are repeated, not as recommendations, but as concepts deserving consideration.

Links with process companies

43. It has been suggested that UK contractors should try to develop financial and technical links through shareholdings held by process industries who can provide them with the broader technical base which they seek. Such financial links might be thought to have a stimulating effect but there is obviously a risk that being linked with an oil or chemical company could inhibit international business and opportunities with companies in those same industries. On the other hand, contractors are currently in the position of receiving confidential information from competing companies; therefore, provided the link was not a dominant one, there could well be little inhibition and new plants, together with the financial backing, would give the contractors a major impetus. However, process companies are not likely to be attracted towards this proposal, particularly at a time when such companies are tending to shed extraneous activities. There have been both successful and unsuccessful examples of this type of linkage and it appears to have been successful in Japan and Italy.

Links with other large groups

44. The Wilson Committee* suggested that the Nuclear Consortia might enter the process engineering field. This idea has merit, particularly as the Committee feel that it is important to British industry for a few large British contractors to attain the reputation enjoyed by some overseas competitors for having diverse abilities in addition to those in the process plant field. The Committee hopes that any action taken to meet this suggestion would not increase the total number of contractors operating in the process plant field.

45. A further suggestion is the possibility of process plant contractors having routine associations with large groups in other industries, such as for example mechanical, civil or electrical engineering, particularly with groups which have international operating experience and contacts in many countries via their sales offices. Some of the existing contractors already have behind them the resources of an engineering group, though this does not assist in the specialist contractors search for the process know-how necessary for his full participation in the world market.

Consortia

46. The use of ad-hoc consortia as vehicles for penetration into overseas markets is of growing importance, avoiding wasteful duplication of effort particularly where foreign competition is involved, and the British process

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* Committee of Enquiry into Delays in Commissioning CEGB Power Stations, March 1969. Chairman Sir Alan Wilson, FRS, Cmnd. 3960, paragraph 114.

plant contractors have been energetic in pursuing business in this way. The Committee feels that this type of activity has its part to play, but also feels that consortia are often less effective and less attractive to the customer than independent entities with the advantage of a single central management.

47. The suggestions made above (paras. 43–46) are primarily for the consideration of the process plant contracting industry itself. The Committee, while recognizing the difficulties, emphasizes again its firm belief that the first and immediate step towards the enhanced international status and reputation desired should be the emergence of a small number of powerful UK contractors with the ability of securing the necessary encouragement and backing of the process industries, the IRC and the Government, particularly in the difficult early period of reorganization. Of course, the backing of the process industries, a normal feature in other countries, is the most important.

V. Objectives—Plant Manufacturers

General

48. A wide range of industries is embraced under this heading and their importance as a large and basic sector of the engineering industry needs no special emphasis. However, plant manufacturers in general have, during our discussions, been criticized and unfavourably compared with those of other countries for lacking a sense of urgency and timing, for an inadequate knowledge of modern management techniques, and for not developing fully the talents of young entrants to the industry. These criticisms do not apply to all firms ; equally, they do apply as generalizations to other industries also. Few things are more important than a change in these basic attitudes. While such changes can only come from within, the following paragraphs suggest ways in which a better environment for change could be provided and improvement could be fostered.

Industrial Structure

49. We have already briefly indicated the problems concerning the plant manufacturers—indeed we believe that these have already had substantial publicity—and consider that there is urgent need for changes in industrial structure leading to a smaller number of substantially larger integrated companies. The considerable majority of companies providing plant of the various kinds required by the process industry are very small with annual turnovers in the range of £¼ million to £1½ million. We have met no one in the course of our discussions who does not believe that there are too many firms in each sector and who does not accept that many advantages would flow from the creation of a smaller number of larger integrated units, though understandably there are certain qualifications to this view, especially on the part of those most likely to be directly affected. The Committee recognizes that some of these small companies are run efficiently and in accordance with good managerial practice, and also that certain specialized products and services are, and always will be, best provided by such small companies. It is likely that there will always be a place for the small specialized company, though it is possible that even such companies could achieve even greater efficiency if absorbed in an enlightened manner by a larger unit. The benefits expected from the formation of larger and more efficient units include the following :—

(*a*) An ability to attract and employ higher grade managerial staff.

(*b*) The financial strength to support and maintain the higher level of investment required in new and advanced equipment.

(*c*) Better utilization of costly and advanced plant.

(*d*) Better planning and production control.

(*e*) The specialization of workshops and the economies of longer production runs on standard units.

(*f*) Expert market research so that changes in demand can be anticipated and prepared for.

(*g*) Aggressive technically-based sales penetration, particularly in exports.

(*h*) The stature to maintain a sensible bidding policy.

(*i*) An ability to recruit and train sufficient skilled labour and to be able to maintain an adequate level of key personnel even through slack periods.

50. The Committee considers that the slow rate of introduction of modern management techniques is not caused primarily by an obstructive attitude on the part of existing managers but rather by the limitation of resources resulting from low turnover levels which precludes managements from the introduction of modern techniques and supporting services at a viable level. It has not been possible to be precise about the volume of turnover necessary to sustain the minimum requirements throughout the range of services required by the process plant industry, but the Committee believes that very approximate calculations can be made for particular types of company and service. Taking Research and Development as an example, it could be postulated that a minimum annual expenditure of around £¼ million per company is necessary to meet the cost of developing, designing and testing new and improved products and techniques in the fields of mechanical engineering appropriate to much of the process plant equipment supply industry, and of employing specialists capable of interpreting the findings of outside research organizations. If it is further postulated that expenditure on Research and Development should be approximately 2½ per cent. of turn-over (which seems appropriate in this case) then a minimum annual turnover of £10 million is the threshold level for viable R. & D. This should be compared with the £¼ million-£1½ million which is common in the British plant-manufacturing industry. Similar calculations could be made for market research, production planning, resource loading, work study, data processing and many other modern management techniques required. While these can only be broad estimates their significance is worth wider appreciation. For example, in the case of pump and valve production, only one or two UK firms have a turnover around £10 million, whereas one of our main European competitors has a turnover several times this very approximate threshold figure.

51. It is not enough to form large scale companies unless positive efforts are made to achieve higher levels of efficiency in order that the benefits of scale may be obtained, but the Committee is quite satisfied that such

benefits cannot be reached until large scale has been achieved. It is concerned that concentration in plant manufacture should not lead to the emergence of monopolies in the supply of many items, and it does not consider that the wholesale reorganization of a multitude of small firms, or all the general firms, is necessary or desirable.

52. The Committee recognizes that the IRC has already done much in certain sectors of the manufacturers supplying the process plant industry, but is concerned by the urgency of the problem and the necessity for rationalization to be carried out in the most enlightened manner. The IRC always consults well-informed industrialists in a particular sector in which they are contemplating action, and has assured us that they will continue to do so. The Committee is keenly aware of the importance of such consultation, and the great value which results from a full utilization of the experience of such industrialists with their knowledge of the personalities and special problems involved in particular sectors. The fullest possible participation of the industry in this way should be intensified, to assist in the formulation of requirements and proposals and to seek the best route to rationalization and efficiency. The Committee recognizes that the ultimate decisions lie with the owners of the companies concerned and with the shareholders advised by the boards of the companies ; nevertheless it is convinced that the necessary overview of industrial structure as a whole and practical proposals for its improvement can best be provided in this way.

Professionalism in management

53. The quality of management in many of the plant manufacturers is thought to be relatively poor. Yet the pace of technical change, the increasing size and complexity of new process plants, and the urgent need for an improved relationship with contractors and users, all imperatively demand high calibre professionally minded management. It is essential that managers keep abreast of the latest management tools and techniques in all fields, such as budgetary control, production scheduling, market research, project evaluation and investment planning. Whilst it is true that no technique can by itself make a good manager, and it is also true that no single man can master the whole range of management skills, nevertheless a good management team in a modern engineering company should be aware of the major new advances in management methods, and capable of applying any of these techniques, including computer technology, which will benefit the company. This has major implications, not only for the threshold size of efficient companies, but also for management training programmes. Men are still appointed to responsible positions without adequate preparation, even though suitable courses are

available. Boards of Directors should not merely pay lip-service to the importance of management training, but should play an active part in developing a coherent training and succession policy for senior management, including themselves.

54. The Committee has made clear its belief that substantial further rationalization is essential in many sectors of the plant manufacturing industry, in order to provide the right environment for recruiting and developing higher quality management. This would facilitate the emergence of really strong management teams in each of the main product groups, which would be in command of the necessary resources and specialist management skills to apply the most modern techniques to production, marketing and new product development. However, even after such a rationalization has taken place, many smaller firms and general engineering firms will continue to co-exist with these larger specialist firms. In all of them a persistent and continuing effort to improve the quality of management will be essential if they are to survive in more competitive conditions. Although the Committee believes that rationalization on the lines proposed, strongly supported by the user industries, would be the most important single step to realize the objective of a highly efficient well-managed industry, it recognizes that there is no quick and easy solution, and that a determined long-term effort will be necessary. It is for this reason that we have also stressed the importance of management training. For this reason too the Committee believe that management consultants have an important and continuing role to play. The best-managed firms can benefit from an independent, sympathetic but objective scrutiny of their management systems and practices. For the poorly managed firm, it may be one of the few ways open to bring about a drastic improvement. Even when management has identified the changes which are needed, outside consultants may often act as a catalyst and provide the time which is necessary to make the changes effective. Consequently the Committee welcomes the pilot scheme which was operated by the Board of Trade in the Glasgow and Bristol areas to provide a measure of Government support for consultants' advice to management of small firms. Subject to the evaluation of the experiment, the Committee feels that this type of scheme could usefully be extended; if this experiment is not successful, alternative means to achieve the objectives should be found.

Trade Associations

55. The Committee notes with some concern that the interests of the process plant manufacturers' industries are represented by a large number of Trade Associations, many of which are small bodies with limited resources and inadequate support, and which have not been linked by

effective means. This has obvious disadvantages and the Committee felt that more positive and generous assistance from their member industries was needed to enable them markedly to increase their financial, personnel, technical and marketing strengths. The Committee supports the general recommendations of the Confederation of British Industries (CBI) report 'A Review of Mechanical Engineering Trade Associations'. In particular the Committee notes the formation of BRIMEC (the British Mechanical Engineering Confederation), and hopes that it will become a focus for restructuring of the mechanical engineering Trade Associations; it also urges that the Associations should take active steps to merge into larger groups. There are difficulties in that some Associations are customer-oriented irrespective of product, whereas others are product-oriented irrespective of customer. However, it is necessary to tackle these difficulties in order to create stronger bodies in the interests of members.

56. The Committee believes the example of BEAMA (British Electrical and Allied Manufacturers' Association) deserves to be closely studied. It also represents industries which manufacture a wide range of products and hence have a similar breadth of sector interests and problems. BEAMA has built up a strong position in its lifetime, having the overall strength for dealing with Government and customer, yet able to deal with sector details through its divisional structure. This overall strength has enabled it to play a role in discussions on restructuring of the industry. Now that Europe is becoming an increasingly important market for electrical products BEAMA finds itself playing a leading part in European collaboration with counterpart organizations through ORGALIME (Organisme de Liaison des Industries Metalliques Européennes), the European Association of Engineering Trade Associations. The Committee considers that it would be highly desirable for the newly constituted mechanical engineering trade association organization to achieve a similar position of influence to that of BEAMA, and urges all sides of the industry to give it maximum support towards this end.

Raw materials

57. While process industry customers and process engineering contractors must both depend on the plant manufacturers, these in turn depend on their suppliers of raw materials. The Committee has heard of serious and long standing difficulties with the supply of all but the simplest steel products. It has also been impressed on the Committee that the supply of both iron and steel castings and forgings has long been thought unsatisfactory both in terms of delivery and quality. In the case of steel plate, limitations in sizes available from UK sources of both

stainless and carbon steel plates mean that even for the largest pressure vessels made at present plate must be imported. This fact should be considered in relation to the forecast referred to earlier in this report of still larger unit size requirements in the future. Another factor which has received emphatic mention is the 20 per cent. premium charge for ultrasonic inspection of steel plate which is said to be higher than similar charges in other countries and has received mention also in the report of the Committee of Enquiry on Pressure Vessels.

58. These are large problems, the proper examination of which would have extended both time and terms of reference too far. However, there is clearly an urgent need for the suppliers in the steel and foundry industries to come together with their process plant customers to tackle these problems, to define present and future requirements more closely, and to determine the ability of the UK industries to meet these requirements. The process industries also have a positive and essential role to play here in continued support for the manufacturer in the resolution of these raw material supply problems.

VI. Finance

Industrial change

59. The Committee identified no requirements, apart from the question of risk insurance mentioned below, in which existing sources of finance were not adequate or potentially adequate. This is not to say that all the present arrangements were completely satisfactory, but that such possible refinements as were suggested were generally of a detailed and esoteric nature, best dealt with by existing mechanisms for discussion. It is however worth emphasizing at this stage the importance which the Committee attaches to the restructuring of the supply industry. A particular deficiency is in the internal financial resources available to the majority of small plant-manufacturers to carry out essential R. & D., market research, investment in new capital equipment, and the necessary improvement programmes.

60. The Committee has expressed its firm belief that the formation of larger and more efficient groupings is the first and urgent step needed to create the necessary resources and strength to support these programmes. There are various Government departments and other organizations studying the problem of Government financial incentives and grants for companies making capital investments in new plant and the Committee did not feel either justified or competent to give this subject the very deep or detailed study that it so obviously required.

61. Certainly the Committee believes that, if and when new or alternative financial grants or incentives for capital investment programmes are being considered, it should be borne in mind that the paramount need is to support and encourage those companies that show a positive attitude towards becoming more efficient rather than providing investment incentives irrespective of the contribution that such investments make towards a company's efficiency or viability.

62. The present problem of obtaining private finance and the high rates of interest are obviously a disincentive to new capital investment programmes and, while this is clearly undesirable, it does tend to create the conditions whereby mergers and rationalization become more attractive. It would be unfortunate if such moves were themselves frustrated by the high cost of money and it is possible the IRC may have a special role to play at this time in using its available funds more extensively and with a flexibility related to the current situation.

Risk insurance

63. The problems which present themselves in considering the first use by a process industry customer of a UK contractor or of UK equipment have been discussed in paragraphs 12-14. The Committee considered the suggestion of tying part of the Government investment grants to the use of UK contractors and equipment, as it could be considered somewhat anomalous to provide Government money for the recipients (whether UK or foreign controlled) to employ foreign controlled contractors and to purchase foreign equipment, thus perpetuating the problem. The Committee decided that this might counter the purposes for which investment grants are intended and was therefore not feasible. However, it does recommend that where a UK contractor is employed on a process in which he has had no previous experience, or if newly designed British equipment is used, Government-sponsored arrangements should be available to cover any special risks which may be involved. This requirement has already received some consideration by the National Research Development Corporation but it is a complex problem deserving in addition study and ingenuity by the Ministry and the industries involved.

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To the Rt Hon Anthony Wedgwood Benn MP
Minister of Technology

17th July 1969

Dear Minister,

I am pleased to submit the report of the Process Plant Expert Committee, which you appointed in September 1968 with the following terms of reference:

'To consider, in consultation with the Process Plant Working Party, the measures necessary to promote co-ordination of the process industries and process plant suppliers; to define objectives for the future development of plant supplies; to make detailed recommendations designed to promote the efficiency and competitiveness of plant suppliers; and to advise on the adequacy or otherwise for these purposes of the finance available to them from their own resources or other existing sources of finance.'

The background to the appointment arose from the period centred on the year 1966, now recognised as a time of exceptional and so far unrepeated demand for process plant, when delays were the subject of much criticism by customers in the process industries. The Process Plant Working Party, on which the main interested bodies are represented, was set up by the National Economic Development Office in July 1966, and has since been doing invaluable work in co-ordinating and publicizing information on investment programmes and changes in process plant demand and supply. The Expert Committee saw its own task, as reflected in our terms of reference, as supplementing this work by recommending ways in which the home supply of process plant can be improved so that the needs of home and export markets can be met more effectively. It follows that it was the weaknesses and not the acknowledged strengths and achievements of these industries which were the Committee's main concern.

The fourth report of the Process Plant Working Party, issued as we completed our work, indicates that a further upsurge of demand is expected later this year. The prosperity which will result from this increased volume of work should not be allowed to obscure the need for the changes we have recommended.

Yours sincerely,

ROY W. WRIGHT
Chairman

The Committee

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Deputy Chairman and Deputy Chief Executive, The Rio Tinto-Zinc Corporation Limited

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Deputy Chairman, I.C.I. Paints Division

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Mr. Trevor J. Brown
UK Atomic Energy Authority, attached to Ministry of Technology

Assistant Secretary

Mr. Douglas R. Dedman
UK Atomic Energy Authority, attached to Ministry of Technology

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Definitions

The three sectors of industry principally concerned with process plant are as follows:—

THE PROCESS INDUSTRIES

For the purpose of this report the Committee limited its study to the Chemical, Oil and Petrochemical industries. The influence, particularly on plant equipment supplies, of some allied industries such as Gas and Electricity Generation were also taken into account where they exhibited common features.

THE PROCESS PLANT CONTRACTORS

These are the chemical engineering contractors who are capable of obtaining a process licence, designing the plant, procuring the equipment, supervizing the construction and handing over the plant to the process industry client. They are not to be confused with civil engineering contractors whose role in the process industries is generally limited to design and construction of roadworks, buildings, water supplies and similar civil engineering activities.

THE PROCESS PLANT MANUFACTURERS

These are the manufacturers of equipment for process plant: pumps, valves, compressors, pressure vessels, heat exchangers, pipework, instruments, unit plant (for such processes as grinding, mixing, filtration and crushing), and similar items. In many cases, process plant equipment is only a part of a manufacturer's range of products.

Summary

In discussing the problems of process plant supply with the process industries, the process plant contractors, and the plant manufacturers, the Committee notes the failures in communication which have occurred and the lack of mutual confidence which exists, due primarily to the disparities between them in size, financial strengths, technical and managerial competence and general business philosophies. There is an urgent need for a greater sense of common interest between these industries and for more widespread recognition of their necessary and unavoidable interdependence.

Within this framework, a prime requirement for improved plant supply is a higher degree of managerial efficiency among the plant manufacturers. There is an urgent need for the emergence of a smaller number of substantially larger companies which will have greater strength and an improved capability to deploy and develop the wide and increasing range of management techniques and modern technology which are required now and will be required to an increasing degree in the 1970s. Fewer and stronger Trade Associations in these areas are also required.

In the field of the process plant contractor the Committee similarly believes that there is a need for the emergence of a few UK contractors even stronger than they have become over the past several years in order to meet successfully the intensifying world wide competition.

None of the above suggestions is new, and the solutions urgently required will not be achieved quickly enough without outside pressure and support. The basic aim of the recommendations which follow is to exert this pressure and thereby improve the efficiency of the supply of process plants in the United Kingdom and for export.

Recommendations

Structure and management

1. Since the changes recommended below seem unlikely to be brought about with the necessary degree of urgency without the application of constructive commercial pressure, we recommend that the Minister should initiate discussions with larger process industry firms, the Central Electricity Generating Board (CEGB) and the Gas Council, to determine ways in which their technical and purchasing power might be brought to bear with a view to encouraging and supporting the better and more forward looking manufacturers and to squeezing out the poor ones. Where rationalization is brought about to produce larger and more efficient companies, either by the industry itself or the Industrial Reorganization Corporation (IRC), the support would need to be particularly provided during the difficult post-rationalization period so long as the objectives are being achieved (paragraphs 23, 25).

2. The Boards of leading companies in each sector of the plant manufacturing industries should urgently consider how to improve the structure of their industries and bring about the emergence of a small number of more efficient larger groupings, deploying greater resources (49–51).

3. In contemplating action in a particular sector the IRC consults well-informed industrialists in that sector. The Committee recommends that such consultation be intensified in an informal manner, so that the detailed and personal knowledge of these leading industrialists can be brought to bear on the problems of industrial structure, and can assist further in developing a climate within the industry which would enable subsequent changes to be effected (52).

4. Since an urgent improvement in management standards is a fundamental aim of the rationalization proposed and is critical for its success, the Boards of the individual manufacturing companies should pay special attention to the selection of key managers and to the establishment of proper management development and training programmes. In addition, government-aided schemes for encouraging the use of consultants should be pursued (53–54).

5. The Boards of the major UK process plant contractors should consider how the emergence of a small number of powerful contracting firms with wider technical bases and substantial international organizations, could be brought about (38–41, 47).

Long term investment programmes

6. The process and allied industries, together with the relevant nationalized industries should, in their own interest, and as some of their number are already doing, attempt to develop steadier, long term investment programmes, reducing the degree of their reaction to relatively short term alterations in market situations, in order to smooth out the swings in demand which have had unfortunate effects on the plant supply situation in the past (15–16).

Trade Associations

7. Present Trade Associations of plant manufacturers should give urgent consideration to the creation of fewer, larger and stronger Associations. The Committee hopes that the newly formed British Mechanical Engineering Confederation (BRIMEC) may provide the necessary focus (55–56).

Raw materials

8. The plant manufacturers, with support from their customers, should make renewed approaches to their raw materials suppliers in order to secure resolution of the problems which we have briefly indicated. In particular, the steel industry and the iron and steel casting and forging industries should be requested urgently to examine the requirements of the process plant manufacturers in order that they may declare their policy towards the fulfilment of these requirements (57–58).

Further studies

9. The Boards of leading companies in the process and allied industries and the process plant contractors should initiate a high level review of their purchasing and contractual policies and in particular of those defects which throw undue strains on plant suppliers (26–30).

10. The Government Departments concerned should consider the provision of a risk insurance scheme with the object of promoting the first commercial use of new British plant and processes (63).

Executive action

11. The Committee recommends that the Ministry should formally draw the attention of the Boards of some major companies and other bodies concerned to those recommendations addressed to them, and should request their urgent consideration.

MINISTRY OF TECHNOLOGY

Report of the Process Plant Expert Committee

July 1969

LONDON
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1969

SBN 11 470070 2